

DISCARDLESS

STRATEGIES FOR THE GRADUAL ELIMINATION OF DISCARDS IN EUROPEAN FISHERIES

(HORIZON 2020 GRANT AGREEMENT NO: 633680)



Landing Obligation 2019:

What have we learned, what are the next steps?

Small landings in small harbours

A case study from Greece

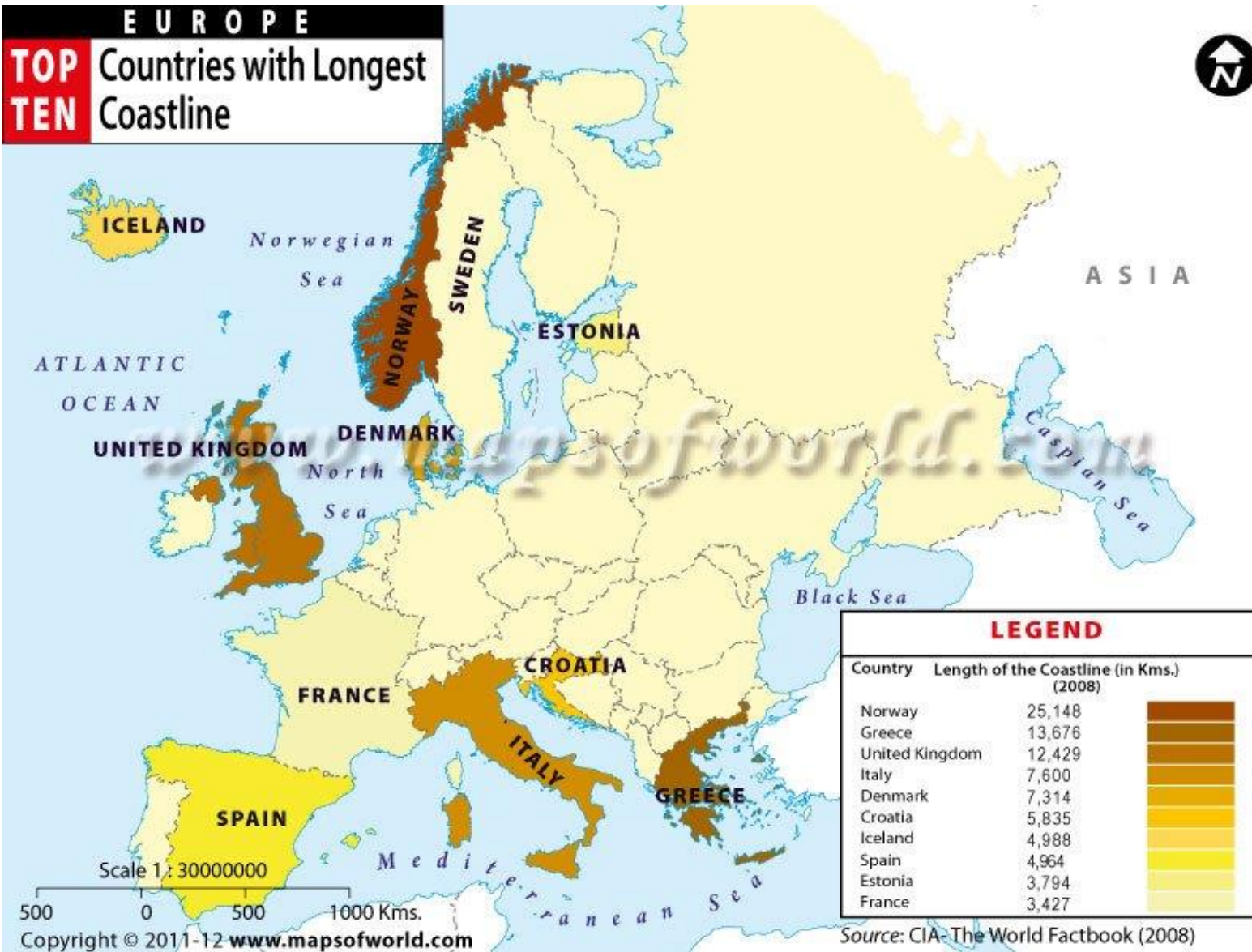
Dr. George Triantaphyllidis, Greece

GeorgeTrianta@hotmail.com



MEDAC meeting, Malaga April 10th 2019

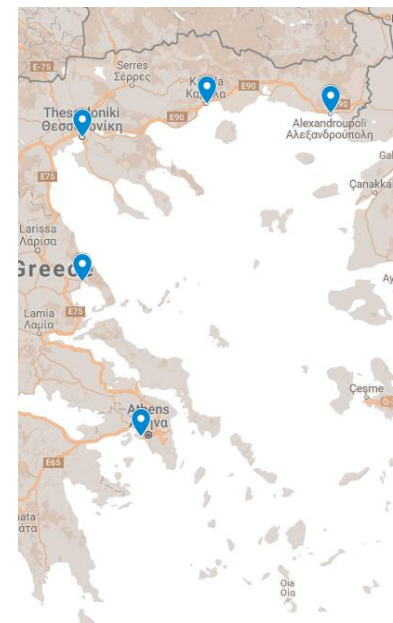
Greece: overview of fishing fleet, ports, production



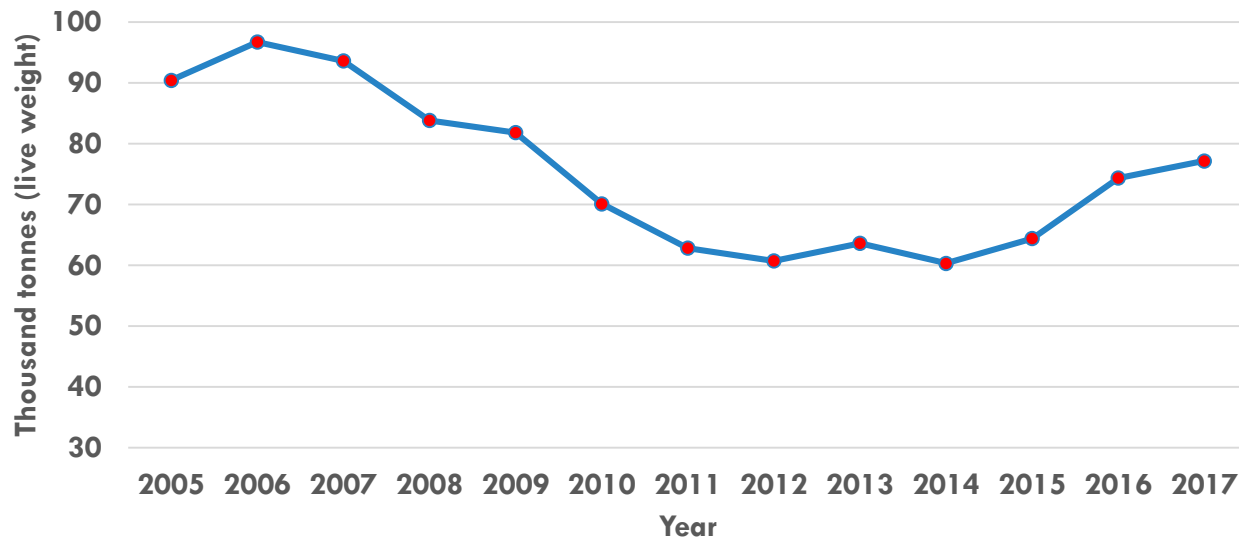


Change (%) 2017/2016
-1.3
-1.6
-0.8
-2.4
-1.3
-0.4
-1.3

Source: ELSTAT



Greece: overview of fishing production



Are we are ready for discards... if they come?

The solutions for dealing with unwanted catches should be based on, in order of priority: avoidance, selection and utilization.

Estimating discard quantities in Greece

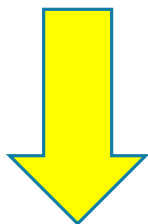
Scientific name	Minimum size	Common name
1. Fish		
<i>Dicentrarchus labrax</i>	25 cm	Sea-bass
<i>Diplodus annularis</i>	12 cm	Annular sea-bream
<i>Diplodus puntazzo</i>	18 cm	Sharpsnout sea-bream
<i>Diplodus sargus</i>	23 cm	White sea-bream
<i>Diplodus vulgaris</i>	18 cm	Two-banded sea-bream
<i>Engraulis encrasicolus</i> *	9 cm	European anchovy
<i>Epinephelus spp.</i>	45 cm	Groupers
<i>Lithognathus mormyrus</i>	20 cm	Stripped sea-bream
<i>Merluccius merluccius</i>	20 cm	Hake
<i>Mullus spp.</i>	11 cm	Red mullets
<i>Pagellus acarne</i>	17 cm	Spanish sea-bream
<i>Pagellus bogaraveo</i>	33 cm	Red sea-bream
<i>Pagellus erythrinus</i>	15 cm	Common pandora
<i>Pagrus pagrus</i>	18 cm	Common sea-bream
<i>Polyprion americanus</i>	45 cm	Wreckfish
<i>Sardina pilchardus</i> **	11 cm	European sardine
<i>Scomber spp</i>	18 cm	Mackerel
<i>Solea vulgaris</i> or <i>Solea solea</i>	20 cm	Common sole
<i>Sparus aurata</i>	20 cm	Gilt-head sea-bream
<i>Trachurus spp.</i>	15 cm	Horse mackerel, Scad
2. Crustaceans		
<i>Homarus gammarus</i>	300 mm TL 105 mm CL	Lobster
<i>Nephrops norvegicus</i>	20 mm CL 70 mm TL	Norway lobster
<i>Palinuridae</i>	90 mm CL	Crawfish
<i>Parapenaeus longirostris</i>	20 mm CL	Deep water rose shrimp
3. Mollusc bivalves		
<i>Pecten jacobaeus</i>	10 cm	Scallop
<i>Venerupis spp.</i>	25 mm	Carpet-clams
<i>Venus spp.</i>	25 mm	Venus-shells

Estimating discard quantities in Greece

Trawlers (246 vessels): 35-42% of the total catch

Purse seiners (239 vessels): 2-4% of the total catch

Artisanal (14.290 vessels): 10-15% of the total catch



Trawlers: around 20.000 mt

Purse seiners : around 2.200 mt

Artisanal : around 19.000 mt

Difference between Mediterranean and Atlantic fishery:

- **In Mediterranean the discard fraction of undersized commercial species is about 15%-20% of the total catch, while the remaining are non commercial species.**
- **In the Atlantic the discarding fraction of undersized species usually is the main part of the total discards**

Alternative solutions for Greece: fishmeal and fish oil or silage production



Raw material

	Annual landings	Discard off-shore		Total volume through domestic markets		Commercial markets		Retail markets		Sum (ton)
		%	ton	%	ton	%	ton	%	ton	
<i>Total Greece</i>	60.000	39%	38361	70%	45000	5%	2250	10%	4500	45.111
<i>Athens</i>	20.000	39%	12787	70%	15000	5%	750	10%	1500	15.037
<i>Thessaloniki</i>	10.000	39%	6393	70%	7500	5%	375	10%	750	7.518
<i>Kavala</i>	20.000	39%	12787	70%	15000	5%	750	10%	1500	15.037
Sum (ton)	50.000		31.967				1.875		3.750	37.592

	Sum (ton)		Total		Lean 65%		Fatty 35%	
			ton annually	Ton/24h	ton annually	Ton/24h	ton annually	Ton/24h
<i>Total Greece</i>	29.322							
<i>Athens</i>	9.774	<i>Athens</i>	9.774	6.353	24	3.421	13	
<i>Thessaloniki</i>	4.887	<i>Thessaloniki</i>	4.887	3.177	12	1.710	7	
<i>Kavala</i>	9.774	<i>Kavala</i>	9.774	6.353	24	3.421	13	
Sum (ton)	24.435							



Chitosan

Biomolecules

Crustacean shells



Chondroitin sulfate

Biomolecules

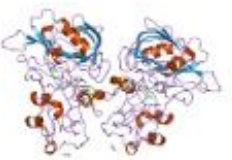
Cartilaginous fishes



Compost-Fertilizer

Other options

All species and all part.



Enzymes

Biomolecules

Fish, especially digestive organs



Fish meal and Fish Oil

Animal feed

All fish and shelfish



All Ingredients: For foods, dietary supplements and what cannot be used previously, can go

	Energy / Chitosan
ENERGY	Biogas
AGRONOMIC USES	Compost
	Fertilizers

Alternative solutions for Greece: fishmeal and fish oil or silage production



<https://www.steinsvik.no/en/products/e/seaculture/seaculture-equipment/deadfish-handling/silage-container>

Alternative solutions for Greece: fishmeal and fish oil or silage production



		Production capacity (ton/24h)	Investment cost (EUR)	Average volumes (ton/24h)
<i>Athens</i>	Lean fish	50	4.000.000	24
	Fatty fish	50	3.500.000	13
<i>Thessaloniki and Kavala</i>	Lean fish	75	4.200.000	37
	Fatty fish	50	3.500.000	20
Sum		225		94.0

Alternative solutions for Greece: fishmeal and fish oil production



Fishmeal production - Mass balance				
	Athens		Thessaloniki & Kavala	
	Lean fish	Fatty fish	Lean fish	Fatty fish
Raw material (ton)	6353	3421	9530	5131
<i>Ton/day</i>	24	13	37	20
Moisture (%)	75.0%	73.0%	75.0%	73.0%
Fat (%)	3.0%	10.0%	3.0%	10.0%
Protein (%)	17.0%	16.0%	17.0%	16.0%
Other (%)	5.1%	1.4%	5.1%	1.4%
FFDM (%)	22.1%	17.4%	22.1%	17.4%
	100%	100%		
Moisture (ton)	4590	2440	6886	3660
Moisture (%)	100%	100%	100%	100%
Fat (%)	0%	0%	0%	0%
Protein (%)	0%	0%	0%	0%
Other (%)	0%	0%	0%	0%
FFDM (%)	0%	0%	0%	0%
Fish oil (ton)	108	278	161	416
Moisture (%)	0%	0%	0%	0%
Fat (%)	100%	100%	100%	100%
Protein (%)	0%	0%	0%	0%
Other (%)	0%	0%	0%	0%
FFDM (%)	0%	0%	0%	0%
Fishmeal (ton)	1662	717	2492	1076
Moisture (%)	10.5%	8.0%	10.5%	8.0%
Fat (%)	5.0%	9.0%	5.0%	9.0%
Protein (%)	65.0%	76.3%	65.0%	76.3%
Other (%)	19.5%	6.7%	19.5%	6.7%
FFDM (%)	84.5%	83.0%	84.5%	83.0%
Fishmeal Revenue	1.898.184 EUR	961.976 EUR	2.847.276 EUR	1.442.964 EUR
Fish oil Revenue	138.268 EUR	356.937 EUR	207.402 EUR	535.406 EUR
Revenue	2.036.452 EUR	1.318.913 EUR	3.054.678 EUR	1.978.370 EUR
Sum	3.355.365 EUR		5.033.048 EUR	
Fishmeal price	1344	EUR/ per ton fishmeal 65% protein		
Fishmeal protein price	2068	EUR/ per ton fishmeal 100% protein		
Fish oil prices	1513	EUR/ per ton fish oil		
Production Efficiency	85%	Affects ther revenue		

Alternative solutions for Greece: fishmeal and fish oil production



	Athens		Thessaloniki & Kavala	
	Plant 1 Lean fish	Plant 2 Fatty fish	Plant 1 Lean fish	Plant 2 Fatty fish
Raw material (ton)	6.353	3.421	9.530	5.131
Revenue	2.036.452 €	1.318.913 €	3.054.678 €	1.978.370 €
Raw material cost	814.581 €	527.565 €	1.221.871 €	791.348 €
Energy cost	23.792 €	12.811 €	35.688 €	19.217 €
Packaging cost	37.941 €	20.430 €	56.912 €	30.645 €
Chemical cost	306 €	132 €	459 €	198 €
Labor Cost	328.500 €	328.500 €	328.500 €	328.500 €
Transportation	571.778 €	307.880 €	857.666 €	461.820 €
Other variable cost	180.768 €	133.416 €	246.515 €	175.486 €
Variable cost	1.957.666 €	1.330.734 €	2.747.611 €	1.807.214 €
<i>Investment cost</i>	<i>4.000.000 €</i>	<i>3.500.000 €</i>	<i>4.200.000 €</i>	<i>3.500.000 €</i>
<i>EC Subsidy 50% on equipment</i>	<i>2.000.000 €</i>	<i>1.750.000 €</i>	<i>2.100.000 €</i>	<i>1.750.000 €</i>
Final Investment cost	2.000.000 €	1.750.000 €	2.100.000 €	1.750.000 €
Insurance	80.000 €	70.000 €	84.000 €	70.000 €
Repairs	200.000 €	175.000 €	210.000 €	175.000 €
Depreciation	60.000 €	52.500 €	63.000 €	52.500 €
Fixed cost	340.000 €	297.500 €	357.000 €	297.500 €
Net profit	- 261.214 € -	309.321 €	- 49.933 € -	126.344 €

Alternative solutions for Greece: silage production



	Silage - Mass balance					
	Athens		Thessaloniki		Kavala	
	Lean fish	Fatty fish	Lean fish	Fatty fish	Lean fish	Fatty fish
Raw material (ton)	6353	3421	3177	1710	6353	3421
<i>Ton/day</i>	<i>18</i>	<i>10</i>	<i>9</i>	<i>5</i>	<i>18</i>	<i>10</i>
Moisture (%)	75.0%	73.0%	75.0%	73.0%	75.0%	73.0%
Fat (%)	3.0%	10.0%	3.0%	10.0%	3.0%	10.0%
Protein (%)	17.0%	16.0%	17.0%	16.0%	17.0%	16.0%
Other (%)	5.1%	1.4%	5.1%	1.4%	5.1%	1.4%
FFDM (%)	22.1%	17.4%	22.1%	17.4%	22.1%	17.4%
	100%	100%				
Moisture (ton)	3501	2009	1751	1005	3501	2009
Moisture (%)	100%	100%	100%	100%	100%	100%
Fat (%)	0%	0%	0%	0%	0%	0%
Protein (%)	0%	0%	0%	0%	0%	0%
Other (%)	0%	0%	0%	0%	0%	0%
FFDM (%)	0%	0%	0%	0%	0%	0%
Fish oil (ton)	50	235	25	117	50	235
Moisture (%)	0%	0%	0%	0%	0%	0%
Fat (%)	100%	100%	100%	100%	100%	100%
Protein (%)	0%	0%	0%	0%	0%	0%
Other (%)	0%	0%	0%	0%	0%	0%
FFDM (%)	0%	0%	0%	0%	0%	0%
De-oiled/thickened Silage	2808	1190	1404	595	2808	1190
Moisture (%)	45.0%	41.0%	45.0%	41.0%	45.0%	41.0%
Fat (%)	5.0%	9.0%	5.0%	9.0%	5.0%	9.0%
Protein (%)	38.5%	46.0%	38.5%	46.0%	38.5%	46.0%
Other (%)	11.5%	4.0%	11.5%	4.0%	11.5%	4.0%
FFDM (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Fishmeal Revenue	1.233.820 EUR	625.284 EUR	616.910 EUR	312.642 EUR	1.233.820 EUR	625.284 EUR
Fish oil Revenue	64.546 EUR	302.153 EUR	32.273 EUR	151.077 EUR	64.546 EUR	302.153 EUR
Revenue	1.298.366 EUR	927.438 EUR	649.183 EUR	463.719 EUR	1.298.366 EUR	927.438 EUR
Sum	2.225.803 EUR		1.112.902 EUR		2.225.803 EUR	

Fishmeal price	1344	EUR/ per ton fishmeal 65% protein
Fishmeal protein price	2068	EUR/ per ton fishmeal 100% protein
Fish oil prices	1513	EUR/ per ton fish oil
Production Efficiency	85%	Affects ther revenue

Alternative solutions for Greece: silage production



	Athens		Thessaloniki		Kavala	
	Lean fish	Fatty fish	Lean fish	Fatty fish	Lean fish	Fatty fish
Raw material (ton)	6.353	3.421	3.177	1.710	6.353	3.421
Revenue	1.298.366 €	927.438 €	649.183 €	463.719 €	1.298.366 €	927.438 €
Raw material cost	519.346 €	370.975 €	259.673 €	185.488 €	519.346 €	370.975 €
Energy cost	8.157 €	4.392 €	4.079 €	2.196 €	8.157 €	4.392 €
Packaging cost	27.622 €	14.873 €	13.811 €	7.437 €	27.622 €	14.873 €
Chemical cost	79.142 €	33.552 €	39.571 €	16.776 €	79.142 €	33.552 €
Labor Cost	197.100 €	197.100 €	197.100 €	197.100 €	197.100 €	197.100 €
Transportation	571.778 €	307.880 €	285.889 €	153.940 €	571.778 €	307.880 €
Other variable cost	124.705 €	93.134 €	77.135 €	61.349 €	124.705 €	93.134 €
Variable cost	1.527.851 €	1.021.907 €	877.258 €	624.286 €	1.527.851 €	1.021.907 €
<i>Investment cost</i>	<i>2.170.000 €</i>		<i>1.560.000 €</i>		<i>2.170.000 €</i>	
<i>EC Subsidy 50% on equipment</i>	<i>1.085.000 €</i>		<i>780.000 €</i>		<i>1.085.000 €</i>	
<i>Final Investment cost</i>	<i>1.085.000 €</i>		<i>780.000 €</i>		<i>1.085.000 €</i>	
Insurance	21.700 €	21.700 €	15.600 €	15.600 €	21.700 €	21.700 €
Repairs	54.250 €	54.250 €	39.000 €	39.000 €	54.250 €	54.250 €
Depreciation	16.275 €	16.275 €	11.700 €	11.700 €	16.275 €	16.275 €
Fixed cost	92.225 €	92.225 €	66.300 €	66.300 €	92.225 €	92.225 €
Net profit	- 321.710 €	- 186.695 €	- 294.375 €	- 226.867 €	- 321.710 €	- 186.695 €

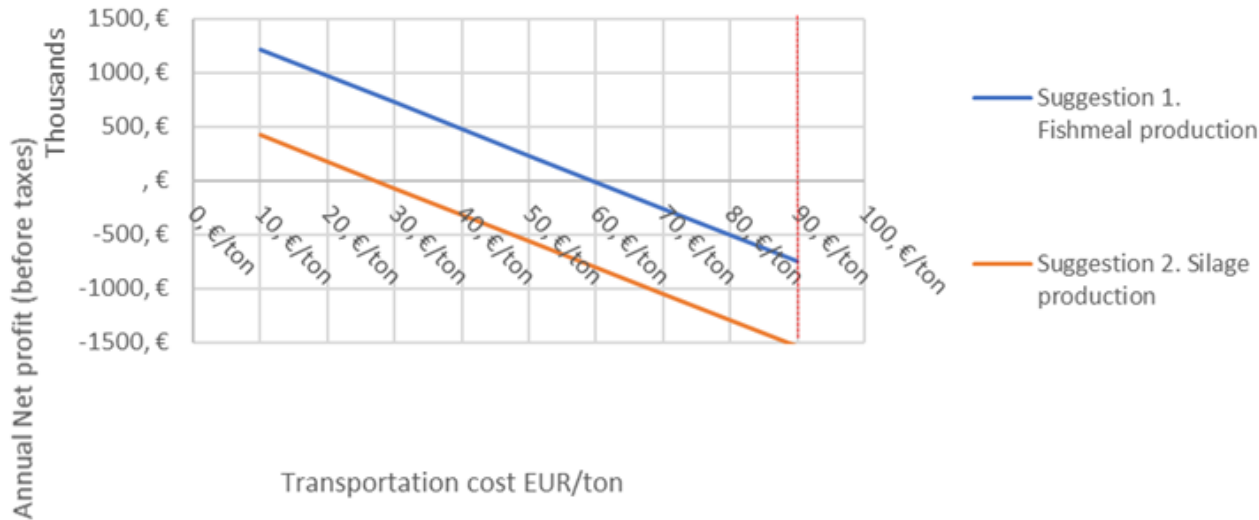
Alternative solutions for Greece: fishmeal and fish oil or silage production



Sensitivity between ROI and RM price



Sensitivity between return on investment and raw material prices to fishermen/stakeholders



Analysis for transportation costs prices to fishermen/stakeholders

Alternative solutions for Greece: fishmeal and fish oil or silage production



Transportation cost (90 Euros/mt MEDAC data) is considerable and the fishing ports are scattered over a large area which forces them to transport little amounts over large distances. Fresh fish or other type of raw materials need frequent pick up to make sure that they don't get ruined and that proper quality is maintained.

The raw material cost was calculated as 40% of the total revenue of silage, fish oil and fishmeal or 0,14 EUR/kg raw material sold to fishmeal and 0,09 EUR/kg if sold to silage.

Sensitivity analysis showed that this price would need to be reduced to 0,10-0,12 EUR/kg raw material sold to fishmeal and 0,03 -0,04 EUR/kg for the overall operation to start running on a minimum profit.

So far, the private sector is unwilling to invest and our cost estimations further support this unwillingness.

Collective fishermen initiatives and EU funding could make the LO to work in Greece and in the Mediterranean Sea in general.

It is evident that eventually someone has to pay the costs for a discard ban and real life shows that a realistic solution must engage the fishermen if one would like to have access to the raw material

Fishermen need to be part of the solution!

Thank you very much!

<http://www.discardless.eu/>

For more information, please visit our web site

